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## PRODUCTION AFTER THE WAR

There appears to be a widespread belief that the chief industrial task for a long period of time will be the replacement of the capital equipment and durable consumption goods that have been worn out or destroyed during the war, and that the capital equipment—the tools of production—has been so impaired in at least certain of the belligerent countries that production will not reach the normal maximum for several years. It is the purpose of this paper to show that this belief is unwarranted. To this end an analysis will be made of the statistics of occupations to determine what portion of the economic energy of the United States is normally devoted to the repair and replacement of the goods in question.

### I. PRODUCTION OF DURABLE GOODS

In 1910 there were 38,167,336 persons ten years of age and over gainfully employed in the United States. These were distributed among the various occupations as follows:

#### OCCUPATIONAL CLASSIFICATION OF PERSONS GAINFULLY EMPLOYED IN 1910<sup>1</sup>

	No. Engaged	Percentage
Agriculture, forestry, and animal husbandry . . . . .	12,665,693	33.2
Extraction of minerals . . . . .	1,059,961	2.8
Manufacturing and mechanical industries . . . . .	10,855,224	28.4
Transportation . . . . .	3,199,069	8.4
Trade . . . . .	4,347,014	11.4
Public service (not elsewhere classified) . . . . .	532,753	1.4
Professional service . . . . .	1,712,489	4.5
Domestic and personal service . . . . .	3,795,133	9.9
Total . . . . .	38,167,336	100.0

<sup>1</sup> Compiled from Table VI, general tables, Vol. IV, of the Thirteenth Census. This table differs from Table I, Vol. IV, of the Census, in that persons engaged in clerical occupations are distributed through the other occupations.

It thus appears that approximately one-third of the persons gainfully employed were engaged in agriculture, forestry, and animal husbandry, a little more than one-third in the manufacturing and mechanical industries, transportation, and the extraction of minerals, and a little less than one-third in trade and in public, professional, and personal service. It is evident that of these eight classes of occupations those persons that were engaged in the production of durable goods will be found in the first four classes, with slight additions from the fifth and seventh classes.

Considering each of these six divisions in order, we find, first that of those engaged in agriculture, forestry, and animal husbandry the following number of persons may be considered as having been engaged in the production of durable goods:

	Persons Engaged
Nursery and orchard foremen, managers, and laborers	37,632
Ditchers.....	15,198
Irrigators and ditch tenders.....	2,883
Blacksmiths, engineers, and machinists.....	3,877
Farmers and farm laborers.....	590,000*
Forestry.....	178,372†
Total.....	827,962

\* Assuming that 5 per cent of the work of the farmers and farm laborers is devoted to the construction and repair of farm equipment.

† Includes woodsmen and lumbermen.

In arriving at the number of persons within the second group that were engaged in the production in question, those that are listed as engaged in production that does not issue into durable goods will be deducted from the total number engaged in the extraction of minerals. The following may be said to belong to this group of producers:

	Persons Engaged
Coal-mining.....	521,745*
Salt mines, wells, and factories.....	6,176
Oil wells and gas wells.....	55,305
Total.....	583,226

\* This is seven-ninths of the total number of persons engaged in coal-mining. About one-third of the coal mined is used in manufacturing, and about two-thirds of the manufactures, reckoned on the basis of persons employed, as is shown later, are durable products.

Deducting this sum from the total number of persons engaged in the extraction of minerals, 1,059,961, we have 476,735 persons in this group whose labor resulted in the production of durable goods.

Following a similar method in arriving at the number of persons in the manufacturing and mechanical industries group who may be counted as engaged in the production of durable goods, the following deductions may be made from the total number of persons engaged in these occupations:

	Persons Engaged*
Chemical and allied industries, excluding paint and fertilizer factories.....	89,762
Clothing.....	677,853
Food and kindred products.....	425,890
Leather industries, not including harness and saddle factories.....	303,480
Liquor and beverage industries.....	99,115
Box factories.....	16,944
Paper and pulp industries.....	126,827
Printing and bookbinding.....	352,965
Textile.....	836,481†
Broom and brush factories.....	16,238
Button factories.....	14,777
Cigars and tobacco factories.....	194,502
Electric light and power plants.....	60,595
Gas works.....	45,070
Oil refineries.....	25,966
Rubber factories.....	56,208
Straw factories.....	7,107
Total.....	3,349,780‡

\*Deductions were made in the case of each of these industries of persons engaged in repair work about the plants.

† Excluding carpet mills and sail, awning and tent factories.

‡ "Other miscellaneous industries" and "other not specified industries" in which 583,572 persons were engaged are counted as producers of durable goods.

Deducting this sum from the total number of persons engaged in the manufacturing and mechanical industries, 10,855,224, there remain 7,505,444 persons in this group that may be considered as engaged in the production of durable goods.

Turning next to a consideration of those who were engaged in transportation, the following may be said to have been engaged in producing durable goods.

	Persons Engaged
Construction and repair in water transportation....	4,503
Construction and maintenance of streets, roads, sewers, and bridges.....	223,215*
Electric and street railways.....	43,383†
Steam railroads.....	708,435‡
Telegraph and telephone.....	46,612§
Express companies.....	238
"Other and not specified transportation" (largely pipe lines).....	3,876¶
Total.....	1,030,262

\* Total number reported, including clerks, etc., but excluding bridge- and tollgate-tenders, lamp-lighters, and street-cleaners.

† Members of skilled trades, linemen, car-repairers, and laborers.

‡ Members of skilled trades, bridgemakers, car-repairers, laborers, and section hands.

§ Members of skilled trades and linemen.

|| Members of skilled trades.

¶ Excluding owners, agents, and clerks.

Lastly, of those who were engaged in wholesale and retail trade, 125,000, the estimated number of those trading in durable goods, may be included here, and also, 118,733 of those who were rendering professional service, this being the number listed as engaged in the scientific professions.

Combining the results of the foregoing computations, we have the following:

#### PERSONS ENGAGED IN THE PRODUCTION OF DURABLE GOODS

Agriculture and forestry.....	827,962
Extraction of minerals.....	476,735
Manufacturing and mechanical industries.....	7,595,444
Transportation.....	1,030,262
Trade and professional service.....	243,733
Total.....	10,084,136

The number thus derived is less than 26 per cent of the total number of persons reported as gainfully employed in the year in question. How exactly this represents the proportion of the indus-

trial population that is normally engaged in the production and repair of durable goods it is difficult to say. In the first place, census statistics are somewhat unreliable, and, further, the classifications as given in the census make a study such as this dependent in considerable part upon estimates. This result is offered only as an approximation, but it is believed to err in the direction of overstating the number engaged in the production of durable goods rather than the reverse. The number of persons who are counted as having been engaged in the production of durable goods within the mining and manufacturing groups was determined by deducting from the total number engaged those shown to have been engaged in the production of non-durable goods rather than by counting those who were definitely listed as engaged in work that results in the production of durable goods. Further, the definition of durable goods as here employed includes all industrial equipment, all means of transportation and communication, all buildings, public and private, all household furnishings, and all household equipment that is made of wood or metal. If the number of persons engaged in the production of vehicles, automobiles, and household furnishings and equipment were excluded from the group of producers of durable goods, the number remaining, it would seem, would be well below 25 per cent of the total number gainfully employed.

## II. PRODUCTION OF CAPITAL EQUIPMENT

The foregoing analysis included a large number of goods that in no way condition the productive capacity of a community. Productive ability depends primarily upon factories and factory equipment, agricultural implements, and railway transportation. Since the purpose of this part of the analysis is to afford some estimate of the length of time that will be required to regain normal maximum production in the belligerent countries, the investigation will be limited to these forms of capital equipment. And since the lack of repair and construction of these capital goods during the war has been due to the absence of wage-earners rather than to the absence of officials or office employees, and will be made up by their return, the number of wage-earners rather than the total

number of persons engaged in the production of these goods will be considered as the decisive factor.

The count of wage-earners in this class of production will be made largely from data contained in the abstract of the census of manufactures for 1914. This census covers establishments which had a value of products of at least \$500 for the given year. The number of wage-earners reported is the average number employed during the year. The fact that there was considerable unemployment during 1914 makes the data for this year somewhat unsatisfactory for this purpose, but as allowance can be made for this fact it is advisable to use this census rather than that for 1909.

Data are not available as to the labor power devoted to the construction and repair of factory buildings, but the census for 1910 shows 1,661,094 persons engaged in the building trades. It is perhaps safe to assume that not more than 10 per cent of the labor of these persons is devoted to the repair and construction of factory buildings.<sup>1</sup> On this assumption, after first augmenting the number by 6 per cent, which was the rate of increase in the number of wage-earners in the manufacturing industries from 1910 to 1914, there were 176,076 persons employed in the construction and repair of factory buildings in 1914.

Turning next to a consideration of the number of wage-earners employed in the manufacture of factory machinery, we find that in 1914 there were 362,471 wage-earners employed in the manufacture of foundry and machine-shop products. These products are classified under 18 divisions<sup>2</sup> into 647 products, comprising almost all of

<sup>1</sup> Estimated on the basis of the number engaged in manufacture as compared with the number engaged in trade and professional service and as compared with the total population, and also by comparing the total value reported for farm buildings in 1910, \$6,325,451,000, with the combined capitalization of all manufacturing establishments for 1909, which was reported as \$18,428,270,000.

<sup>2</sup> Products intended for general use.

Machines and articles for use in the manufacture of food and kindred products.

Machines for use in the textile industries.

Machines and articles for use in the manufacture of iron and steel and their products.

Machines for use in the manufacture of lumber and timber products.

Machines for use in the manufacture of leather and its finished products.

[Note 2 continued on opposite page]

the factory machinery produced and, in addition, certain articles that are designed for household consumption. There are, however, articles of factory equipment, listed elsewhere in the census, which must be included here. The establishments which were devoted to the manufacture of electrical machinery, apparatus, and supplies employed 118,078 wage-earners. The value of subsidiary electrical products manufactured by other firms was 7.2 per cent of the value of the product of these establishments. The classification of the electrical products with their values shows that at least one-fourth of the total may be reckoned as not intended for use in factories. Increasing the number of wage-earners reported by 7.2 per cent and reducing the total by one-fourth, we have 94,935 as the number of wage-earners who may be said to have been engaged in the production of electrical factory equipment. Engines, steam, gas, and water, engaged the services of 29,657 wage-earners. In terms of value, 45 per cent of the engines produced were designed for use outside of factories. On this basis 16,310 wage-earners were producing engines for factories use. In the making of gas machines 731 wage-earners were employed, and 6,188 were employed in the production of steam and other power pumps, which may be included here. Four thousand nine hundred and fifty-three wage-earners were employed in making machinists' tools, 3,643 in producing machine screws, 4,560 in making saws, and 7,639 in producing tools

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Machines for use in the manufacture of paper and of articles from paper, and in the printing, publishing, and allied industries.

Machines and other products for use in the manufacture of liquors and beverages.

Machines and devices for use in the manufacture of chemical and allied products.

Machines and supplies for use in the manufacture of stone, clay, and glass products.

Machines and materials for use in the manufacture of metals and metal products other than iron and steel.

Machines for use in the manufacture of tobacco.

Machines and materials for use in the manufacture of vehicles for land transportation and by railroad repair shops.

Machines and devices for use in building and equipping ships.

Machines and appliances for use in the manufacture of the miscellaneous group (excluding shipbuilding).

Products intended for use in manufactures in general.

Products intended for use in mining.

Products intended for use in agriculture.



which were not specified. One-half of each of these last two totals may be estimated as representing the part of the production that was designed for use within factories. In the manufacture of sewing machines and attachments 14,308 wage-earners were employed. Perhaps at least one-half of this product was for home use rather than for use in factories. Bringing these data together we have the following result:

#### PRODUCTION OF FACTORY EQUIPMENT

	Wage-Earners
Factory buildings . . . . .	176,076*
Foundry and machine-shop products . . . . .	362,471
Electrical machinery apparatus and supplies . . . . .	94,935*
Engines . . . . .	16,310*
Gas machines . . . . .	731
Pumps, steam and other power . . . . .	6,188
Machinists' tools . . . . .	4,953
Machine screws . . . . .	3,643
Saws . . . . .	2,280*
Tools "not specified" . . . . .	3,820*
Sewing machines and attachments . . . . .	7,154*
Total . . . . .	678,561

\* Estimated.

Thus the total number of wage-earners employed in the production of factory machinery and in the construction and repair of factory buildings in 1914 was less than 2 per cent of our industrial population, assuming that 40,000,000 persons were gainfully employed in that year, and the number of wage-earners employed in the production of factory machinery alone was but slightly more than  $1\frac{1}{4}$  per cent of the industrial population.

The manufacture of agricultural implements requires the services of but a very small number of wage-earners, 48,459 persons being reported as employed as wage-earners in this industry in 1914. To this number may be added one-tenth of the total number of wage-earners employed in the manufacture of engines, 2,966, as traction engines made up one-tenth of the value of the engines produced. It may also be noted that a few agricultural implements were included with foundry and machine-shop products.

The relatively small amount of labor power that is devoted to the manufacture of machinery in the United States is not due to an excess of foreign imports of machinery over exports. In fact, our exports of machinery greatly exceed our imports. For the fiscal years ending June 30, 1913, 1914, and 1915, the value of such exports, machinery and agricultural implements, was respectively 22, 22, and 20 times the value of the machinery and agricultural implements imported.<sup>1</sup>

*The Statistics of the Railways in the United States* for 1914, published by the Interstate Commerce Commission, gives the following data relative to the number of persons employed in construction and repair work upon our railways:

#### RAILWAY EMPLOYEES

Machinists.....	56,468
Carpenters.....	72,923
Other shopmen.....	256,133
Section foremen.....	44,977
Other trackmen.....	<u>337,451</u>
Total.....	767,952

The abstract of the census of manufactures lists 71,679 wage-earners as employed in the construction of cars and locomotives by companies other than railway companies. This makes in all 839,631 wage-earners employed in railway repair and construction.

Combining the foregoing data we may arrive at the total number of wage-earners employed in the construction and repair of factory and railway equipment and agricultural implements.

#### REPAIR AND CONSTRUCTION OF SELECTED FORMS OF CAPITAL EQUIPMENT

	Wage-Earners
Factory buildings and machinery.....	678,561
Railway rolling stock and roadway.....	839,631
Agricultural implements.....	<u>51,425</u>
Total.....	1,569,617

The foregoing number does not include all of the wage-earners whose labor contributed to this production. Particularly, no

<sup>1</sup> Monthly Summary of the Foreign Commerce of the United States, June, 1915.

account has been taken of the labor required to produce the raw material necessary to the construction and repair of these capital goods. As the present purpose is to afford some basis for judgment as to the length of time that will be required to make up the war loss that has been suffered in the equipment under consideration, and as the volume of raw materials now being produced for military production is more than adequate for this purpose, it was not deemed necessary to include an investigation of the labor required for the production of the raw materials employed in this capital production.

The preceding figure is also offered only as an approximation. Accepting it as such, and augmenting it by 10 per cent to allow for the unemployment during 1914, we reach the conclusion that approximately 1,727,000 wage-earners were normally devoted to the production in question four years ago. This was but slightly more than  $4\frac{1}{4}$  per cent of our industrial population.

### III. CONCLUSIONS

It is evident from the foregoing investigation that the task of repairing the waste of war suffered by the principal forms of capital equipment is far from prodigious. In our own case we have sufficient man power in the military service and in munition production to make good in an incredibly short time any loss which we have suffered in factory or railway equipment or agricultural implements. If the repair and construction of these goods has been only 50 per cent of normal during the past twelve months, on the basis of the foregoing count the men now in military service could make up the loss in less than three months if their labor were applied to this end. Of course, the labor released by the termination of the war cannot be directed wholly to this work of replacement, but the volume of labor to be released is so large proportionately to the labor power normally devoted to the construction and repair of capital goods as to clearly indicate that lack of labor need not long delay the repairment necessary for the production of the normal volume of the peace-time output. To a somewhat lesser degree this should be true also of England and France, and even of Germany. It also follows, obviously, that the demand on the part of the entrepreneurs

for labor with which to replace the decline in capital equipment which they have suffered cannot be considerable.

Further, the work of bringing out total stock of durable goods up to normal is also less formidable than is commonly assumed. While the maintenance and extension of these goods have suffered somewhat during the war, production in these lines has been far from checked. If, however, we assume it to have been only 50 per cent of the normal during the past year, then, on the basis of the count in the first section, the men now in military service represent enough labor power to make up the loss in a little more than a year.

Conspicuous among the forms of durable goods that have suffered in upkeep and extension during the war are buildings and roadways. But as the total number of persons engaged in the building trades in 1910 was less than one and three-quarter millions, and the number engaged in the construction and repair of roadways was less than a quarter of a million, it is evident that such work cannot absorb a proportionately large amount of the labor released at the termination of the war. Construction work may be expected to represent more than a normal proportion of our economic output during the next few months and should be encouraged as a means of alleviating the unemployment that may accompany the shift from war production to peace-time production, but the large part of our economic energy now, as before the war, will be devoted to the production of consumption goods and largely to the production of non-durable as compared with durable consumption goods.

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